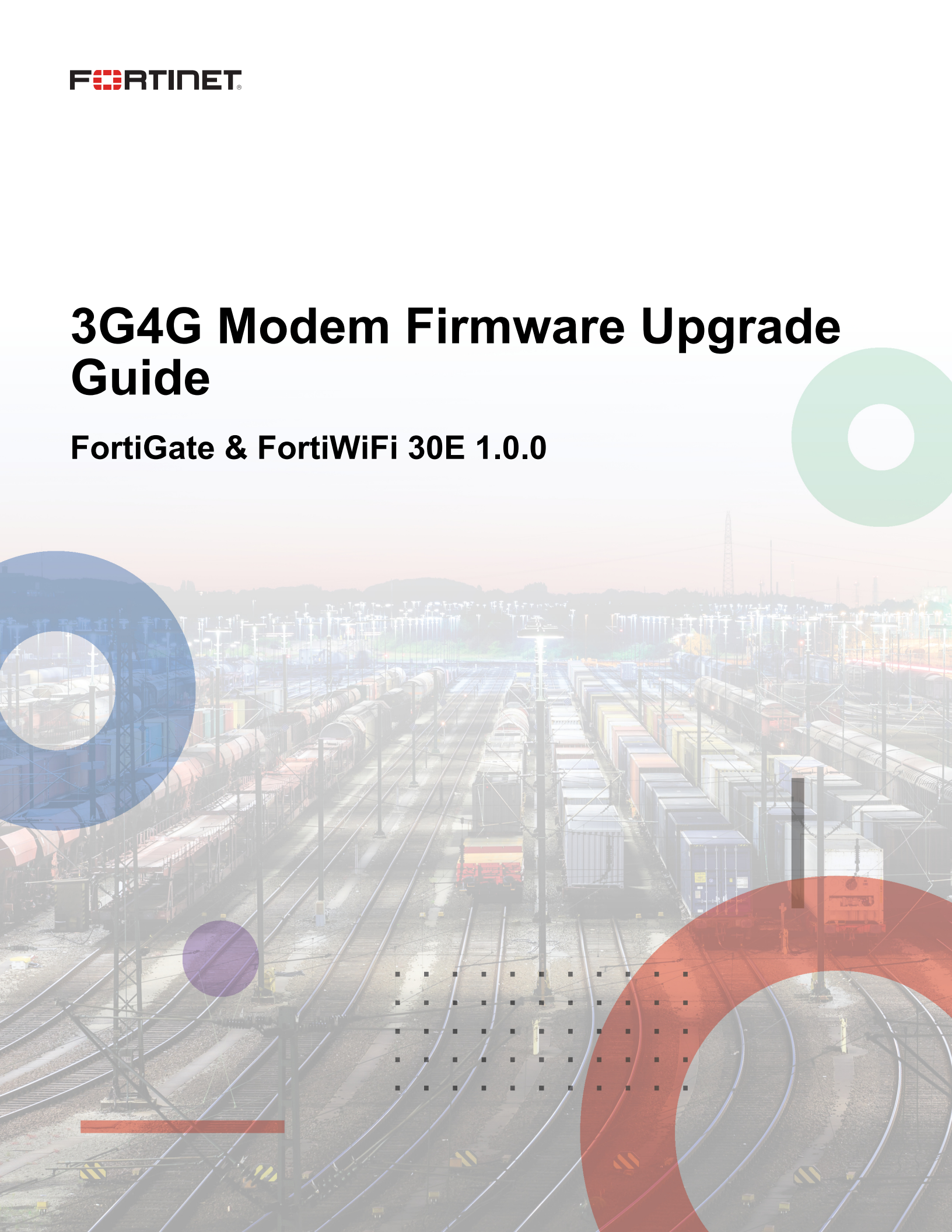


3G4G Modem Firmware Upgrade Guide

FortiGate & FortiWiFi 30E 1.0.0



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March 31, 2022

FortiGate & FortiWiFi 30E 1.0.0 3G4G Modem Firmware Upgrade Guide

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Change Log

Date	Change Description
March 31, 2022	Initial release.

Overview

Fortinet 3G4G LTE devices, such as the FortiGate 30E and FortiWiFi 30E, come with the Sierra Wireless EM7565 LTE internal modem to provide wireless connectivity. The modem is supported by major wireless carriers across Americas, Asia, the EU, and some other parts of the world.

Although the same modem is used by all the carriers, end-users of these Fortinet 3G4G devices must obtain and install their carrier-specific modem images in the modem to ensure that they function properly.

This Guide provides the information and instructions for upgrading the modem image on your FortiGate 30E and FortiWiFi 30E devices. It also shows how to debug and recover the modem if you encounter some issues during the upgrade.

Obtain modem firmware images



Fortinet does NOT host the modem images on Fortinet website. You must follow the instructions below to obtain the official firmware package of your choice from the modem vendor's website.

To get the official Sierra Wireless EM7565 LTE modem images:

1. Go to source.sierrawireless.com.
2. In the Devices section, select **AirPrime > EM Series > em7565** to open the AirPrime EM7565 page.
3. In the Software download section, select **Firmware**.
4. Follow the prompts onscreen to find and download your carrier-specific modem firmware image files.

Get matching .cwe and .nvu files

Each binary (i.e., modem firmware package) contains a `.cwe` file and a `.nvu` file.

For example, if you download and unzip the AT&T Linux Binary, you'll get the following two files:

- `SWI9X50C_01.07.02.00.cwe`
- `SWI9X50C_01.07.02.00_ATT_002_008_004.nvu`

The `.cwe` file is the modem firmware image, and the `.nvu` file is the carrier provisioning PRI file which contains data specific to the carrier (AT&T in this example).

The following table highlights the elements in the name of a `.cwe` file and a `.nvu` file, respectively.

File Type	File Name Components	Example
<code>.cwe</code>	ModemModel_FirmwareVersion.cwe	SWI9X50C_ 01.07.02.00.cwe
<code>.nvu</code>	ModemModel_FirmwareVersion_CarrierName_ PRIVersion_PackageID.nvu	SWI9X50C_01.07.02.00_ ATT_002_008_ 004.nvu



Upon unzipping the binary file and before starting the upgrade process, you **MUST** double-check to ensure that the modem model and firmware version in the `.cwe` and `.nvu` files are identical. Any mismatch between the two will cause the upgrade to fail.

Prepare for image upgrade

Before starting to upgrade the modem firmware, be sure to do the following:

- Double-check to ensure that the modem model and firmware version in the pair of .cwe and .nvu files match each other. Refer to [Get matching .cwe and .nvu files on page 7](#).
- Make sure that your 3G4G device is powered up.
- Make sure that the device is connected to the network (if you want to do the image upgrade from an FTP or TFTP server, or directly from the carrier's website.)
- Place the firmware image files on a desired download location or media, which can be on an FTP or TFTP server, a USB disk. *Ignore this if you are upgrading directly from the carrier's website.*

Upgrade the firmware images

This section discusses the steps that you must follow when upgrading your firmware.

1. [Download the modem firmware on page 9](#)
2. [Download the PRI firmware on page 9](#)
3. [Start firmware upgrade on page 10](#)
4. [Check firmware upgrade status on page 11](#)

Download the modem firmware

The following command transfers the `.cwe` file to the device from an FTP or TFTP server, a FortiGuard server, or a USB disk. It is of the same format as the `execute restore image` command.

```
#          execute lte-modem get-modem-firmware
ftp                Load image from FTP server.
management-station Restore image from Management station.
tftp               Restore image from TFTP server.
usb                Restore image from USB disk.
```



A management-station is a service provider. To download modem firmware from a management-station, you **MUST** have a valid Firmware & General Updates license from the FortiGuard distributed network.

If downloading from a "management-station", continue with the following command:

```
#          execute lte-modem get-modem-firmware management-station
Available carrier:
GENERIC
ATT
VERIZON
TELUS
DOCOMO
SOFTBANK
SPRINT
```

Download the PRI firmware

The following command transfers the `.nvu` file to the device from an FTP or TFTP server, a FortiGuard server, or a USB disk. It is of the same format as the `execute restore image` command.

```
#          execute lte-modem get-pri-firmware
ftp                Load image from FTP server.
management-station Restore image from Management station.
```

```
tftp          Restore image from TFTP server.  
usb          Restore image from USB disk.
```

If downloading from a "management-station", continue with the following command:

```
#          execute lte-modem get-pri-firmware management-station  
Available carrier:  
GENERIC  
ATT  
VERIZON  
TELUS  
DOCOMO  
SOFTBANK  
SPRINT
```

Start firmware upgrade

The downloaded .cwe and .nvu files are stored in device's memory file system. If the two files are a matching pair, the `start-upgrade` command will show up.



The `start-upgrade` command becomes available only after both the .cwe and the .nvu files are downloaded to the memory file system.

Use the following command to start the firmware upgrade:

```
#          execute lte-modem start-upgrade
```

Normally, the upgrade takes about five minutes to complete. During the process, the modem reboots and becomes non-responsive to the following test commands:

```
#          diagnose test application lted 0  
1. Show device info  
2. Show data session connection status  
3. Test connection  
4. Test disconnection  
5. Get signal strength  
6. Get IP address  
7. Get IP address and DNS server  
8. Get SIM card status  
9. Show LTED status  
10. Resync LTED status  
11. List supported AT commands  
12. Get IMEI  
13. Get ICCID  
14. Get firmware preference  
15. Recover firmware preference  
16. Set Internal USB Configuration(reboot needed)  
17. List stored images  
18. Get Msisdn  
19. Get Modem Activation State  
20. Get SIM State
```

- 21. Get RF Band Info
- 22. Get RF Band Capability

Check firmware upgrade status

When the upgrade is completed, the following message appears onscreen:

```
EM7565 Modem Firmware Upgrade Process succeeded!
```

Upon seeing this message, you should use the following command to check the modem stored images:

```
# diagnose test application lted 17
```

Schedule firmware upgrade from FortiGuard

This section provides instructions on how to configure firmware upgrade schedules using FortiGuard. It covers the following topics:

- [Firmware upgrade commands on page 12](#)
- [Perform immediate firmware upgrade on page 13](#)
- [Set an upgrade date and time on page 13](#)
- [Set an upgrade frequency on page 15](#)
- [Cancel an upgrade schedule on page 19](#)

Firmware upgrade commands

Setting firmware upgrade schedules from FortiGuard enables Fortinet devices with the internal Sierra Wireless EM7565 LTE modem to auto-check for firmware upgrade packages, and upgrade the modem firmware via FortiCloud service according to the schedules configured in the system.

You can specify an auto-check update date and time with the system's central-management settings, as illustrated in the following screenshot.

```
FortiGate-30E-3G4G-GBL # config system central-management
FortiGate-30E-3G4G-GBL (central-management) # set
mode                               Central management mode.
type                               Central management type.
schedule-config-restore            Enable/disable allowing the central management server to restore the configuration of this FortiGate.
schedule-script-restore            Enable/disable allowing the central management server to restore the scripts stored on this FortiGate.
allow-push-configuration            Enable/disable allowing the central management server to push configuration changes to this FortiGate.
allow-push-firmware                Enable/disable allowing the central management server to push firmware updates to this FortiGate.
allow-remote-firmware-upgrade      Enable/disable remotely upgrading the firmware on this FortiGate from the central management server.
allow-remote-lte-firmware-upgrade  Enable/disable remotely upgrading the lte firmware on this FortiGate from the central management server.
ltefw-upgrade-time                 Schedule next LTE firmware upgrade time (Local Time). Format: YYYY-MM-DD HH:MM:SS
ltefw-upgrade-frequency            Set LTE firmware auto pushdown frequency.
allow-monitor                      Enable/disable allowing the central management server to remotely monitor this FortiGate
vdom                              Virtual domain (VDOM) name to use when communicating with FortiManager.
enc-algorithm                      Encryption strength for communications between the FortiGate and central management.
```

The following three settings are needed to configure an LTE firmware upgrade schedule:

- `allow-remote-lte-firmware-upgrade`
- `ltefw-upgrade-time`
- `ltefw-upgrade-frequency`

The `allow-remote-lte-firmware-upgrade` option is disabled by default. When this option is disabled, the other two commands will become hidden (unavailable).



Disabling `allow-remote-lte-firmware-upgrade` automatically cancels all set schedules, but does not clear them from the system. The schedules will be activated again once you enable `allow-remote-lte-firmware-upgrade`.

Perform immediate firmware upgrade

You can request a firmware upgrade via FortiCloud service at any time using the following command:

```
exec lte-modem start-upgrade-remote
```



This command will not be available if the `allow-remote-lte-firmware-upgrade` option under the `sys central-management` command is disabled.

Because all LTE functions will be interrupted or suspended during firmware upgrade, the system will prompt you for confirmation. If you choose `y` (yes), the upgrade will initiate in about 60 seconds. See the following screenshot.

```
FG30EGT819001087 # sh sys central-management
config system central-management
    set type fortiguard
end

FG30EGT819001087 # exec lte-modem start-upgrade-remote
Are you sure to perform LTE firmware upgrade right now? All LTE services will be suspended.
Do you want to continue? (y/n)y

LTE firmware upgrade will initiate in 60 seconds!
```



If a schedule has already been configured, issuing the `exec lte-modem start-upgrade-remote` command will trigger an error and abort the upgrade.

To upgrade the firmware right away, you must use `unset ltefw-upgrade-time` in `central-management` configuration to cancel any existing schedule first before using the `exec lte-modem start-upgrade-remote` command.

Set an upgrade date and time

You can schedule a firmware upgrade using the following command:

```
set ltefw-upgrade-time
```

The command requires either of the following time formats:

- "yyyy-mm-dd hh:mm:ss"
- "hh:mm:ss"



Both formats use your local time as input. The former lets you specify a future date and the time of the day, while the latter asks you to specify the time of the day only, as illustrated in the following screenshot.

```

FortiGate-30E-3G4G-GBL # config system central-management
FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-time
"yyyy-mm-dd hh:mm:ss" or "hh:mm:ss" Date and Time (yyyy: 0-9999, mm: 1-12, dd: 1-31, hh: 0-23, mm: 0-59, ss: 0-59).
FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-time "2019-08-23 17:50:00"
FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "2019-08-23 17:50:00"
end
FortiGate-30E-3G4G-GBL (central-management) # end

```



Be careful when scheduling a future firmware upgrade. Do NOT backdate an upgrade. Even though the system currently does not prevent you from entering a past date and time (whether you do it by mistake or on purpose), backdating an upgrade will NOT trigger the upgrade immediately—it does not work!

Once a valid future time string is set, the timer is registered and ticked at the specified time to perform the upgrade procedure. You can view this registered timer and its ticked schedule using the `diagnose test application forticldd 13` command, as shown in the following screenshot.

```

FortiGate-30E-3G4G-GBL # diagnose test application 13
command parse error before '13'
Command fail. Return code -61

FortiGate-30E-3G4G-GBL # diagnose test application forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: no

FortiGate-30E-3G4G-GBL #
FortiGate-30E-3G4G-GBL # config system central-management

FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-time "2019-08-23 17:30:00"

FortiGate-30E-3G4G-GBL (central-management) # show
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "2019-08-23 17:30:00"
end

FortiGate-30E-3G4G-GBL (central-management) # end

FortiGate-30E-3G4G-GBL # diagnose test application forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: on
    LTE Image next upgrade pushdown is scheduled at (UTC) Sat Aug 24 00:30:00 2019

```

In the preceding illustration, "on" means that the FortiCloud remote download service is enabled and the upgrade check/download will be triggered when the timer is due.



The timer trigger date/time displayed in the preceding illustration is in UTC format, which is different from the local-time format specified by user.

If a schedule time is set already, whether it is in the past or future, resetting the time will overwrite the existing value, and register a new timer with a new schedule ticked time.

After a schedule is registered, changing its time to an earlier time will cancel the registered schedule timer, as shown in the following screenshot.

```
FortiGate-30E-3G4G-GBL # diagnose test application forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: on
    LTE Image next upgrade pushdown is scheduled at (UTC) Sat Aug 24 00:30:00 2019

FortiGate-30E-3G4G-GBL #
FortiGate-30E-3G4G-GBL #
FortiGate-30E-3G4G-GBL #
FortiGate-30E-3G4G-GBL # config system central-management

FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "2019-08-23 17:30:00"
end

FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-time "2019-08-23 16:00:00"

FortiGate-30E-3G4G-GBL (central-management) # end

FortiGate-30E-3G4G-GBL # diagnose test application forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: no
```

The preceding illustration not only shows the rescheduled next upgrade push-down time in UTC format, but also displays the time when the last upgrade was actually performed (not the old scheduled time that was overwritten).

Set an upgrade frequency

You can use the following command to specify the frequency of firmware upgrade:

```
set ltefw-upgrade-frequency
```

For the current FortiOS release, the system supports the following frequency options:

Frequency	Description
everyHour	Auto-check for and push down the latest LTE firmware once every hour.

Frequency	Description
every12hour	Auto-check for and push down the latest LTE firmware once every 12 hours.
everyDay	Auto-check for and push down the latest LTE firmware once every day.
everyWeek	Auto-check for and push down the latest LTE firmware once every week.



The frequency value MUST be used in combination with the time value. Otherwise, it'll be meaningless and rejected by the service. See the following screenshot.

```
FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
end

FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-frequency everyHour
Next future upgrade time must be set first!
node_check_object fail! for ltefw-upgrade-frequency everyHour

value parse error before 'everyHour'
Command fail. Return code -20
```



The proper way to set a future upgrade schedule is to set a future time first, and then a desired reoccurring frequency. See the following screenshot.


```

FortiGate-30E-3G4G-GBL # config system central-management
FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
end

FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-time "2019-08-23 17:30:00"
FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-frequency everyDay

FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "2019-08-23 17:30:00"
    set ltefw-upgrade-frequency everyDay
end

FortiGate-30E-3G4G-GBL (central-management) # end

FortiGate-30E-3G4G-GBL # diagnose test application forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: on
    LTE Image next upgrade pushdown is scheduled at (UTC) Sat Aug 24 00:30:00 2019
    LTE Image upgrade frequency is every 24 hours.

```

Once scheduled, an auto upgrade will first take place at the immediate future upgrade time and then repeat at the set frequency, which can be viewed using the `diagnose test application forticldd 13` command.



Setting a frequency to an earlier schedule time is equivalent to setting a frequency to a schedule with no time. FortiOS ignores backdated schedules, so the system will issue an error when you're trying to do so. See the following screenshot.

```

FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "1990-08-10 12:00:00"
end

FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-frequency everyDay
A future upgrade time must be set first! Or use HH:MM:SS format for time.
node_check_object fail! for ltefw-upgrade-frequency everyDay

value parse error before 'everyDay'
Command fail. Return code -61

```



As shown in the preceding message, there is one exception: if you use the `HH:MM:SS` format for the time string, setting the frequency will be allowed even though the specified time may have already passed. The expected behavior of this setting is that the next upgrade time is scheduled just one repeat interval away from the time of the day, as shown in the following screenshot.

```
FortiGate-30E-3G4G-GBL # config system central-management
FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-time "09:30:00"
FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-frequency everyDay
FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "09:30:00"
    set ltefw-upgrade-frequency everyDay
end
FortiGate-30E-3G4G-GBL (central-management) # end

FortiGate-30E-3G4G-GBL # diagnose test application forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: on
    LTE Image next upgrade pushdown is scheduled at (UTC) Sat Aug 24 16:30:00 2019
    LTE Image upgrade frequency is every 24 hours.
```

As shown in the preceding image, it's already 11:43:00 when you set the upgrade time to 09:30:00. Still, the FortiCloud service allows you to schedule the timer to be ticked at 09:30:00 tomorrow. It is important to note that this exception only works when the upgrade time and frequency are set and committed in the same batch. In other words, if a past time (even in the HH:MM:SS format) is set first and committed with `end`, the frequency set later on will become undefined because the service refuses to calculate for the next future update time based on the detached past time and frequency. See the following screenshot.

```
FortiGate-30E-3G4G-GBL # config system central-management
FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-time "09:30:00"
FortiGate-30E-3G4G-GBL (central-management) # end
FortiGate-30E-3G4G-GBL # config system central-management
FortiGate-30E-3G4G-GBL (central-management) # set ltefw-upgrade-frequency everyWeek
FortiGate-30E-3G4G-GBL (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "09:30:00"
    set ltefw-upgrade-frequency everyWeek
end
FortiGate-30E-3G4G-GBL (central-management) # end

FortiGate-30E-3G4G-GBL # diagnose test application forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: no
```



As shown in the preceding screenshot, even though no timer is registered (meaning no upgrade is actually scheduled), the configuration still shows it has a frequency and time configured.

If an upgrade schedule has already been triggered for more than once, changing its frequency or time settings is not allowed unless you cancel the schedule entirely. Note that the next upgrade time will not be updated in the configuration because the `show system central-management` command only shows the first upgrade time you've specified. To view the actual next upgrade time, use the `diagnose test application forticldd 13` command.

In order to avoid all devices querying the FortiCloud server for firmware download, some randomization mechanism has been implemented in the schedule time whenever the upgrade is repeated at a set frequency, as shown in the following screenshot.

```
FG30EGT819001087 # config sys central-management
FG30EGT819001087 (central-management) # set ltefw-upgrade-time "17:48:00"
FG30EGT819001087 (central-management) # set ltefw-upgrade-frequency everyHour
FG30EGT819001087 (central-management) # end

FG30EGT819001087 # dia test app forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: on
    LTE Image next upgrade pushdown is scheduled at (UTC) Thu Aug 15 00:48:00 2019
    LTE Image upgrade frequency is every 1 hours.

FG30EGT819001087 # dia test app forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: on
    LTE Image next upgrade pushdown is scheduled at (UTC) Thu Aug 15 01:50:51 2019
    LTE Image upgrade frequency is every 1 hours.
    Last upgrade was at (UTC) Thu Aug 15 00:48:00 2019

FG30EGT819001087 #
```

The preceding illustration shows that, when the first upgrade operation is triggered, the next upgrade is postponed by about three minutes instead of happening exactly one hour later as set in the scheduled frequency. With schedule time randomization, the actual schedule time is within +/- 3 minutes range of the scheduled time.

Cancel an upgrade schedule

You can cancel an upgrade schedule using the following command:

```
unset ltefw-upgrade-frequency
```

```
FG30EGT819001087 # config sys central-management

FG30EGT819001087 (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "18:08:00"
    set ltefw-upgrade-frequency everyHour
end

FG30EGT819001087 (central-management) # unset ltefw-upgrade-frequency

FG30EGT819001087 (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "18:08:00"
end

FG30EGT819001087 (central-management) # end
```

Note that, if a schedule has already been used for more than once, unsetting its frequency will cancel the next schedule time even though it is already calculated based on the frequency and auto-registered by the daemon.

If the `ltefw-upgrade-time` is in the future (meaning the schedule has not taken effect yet), canceling the schedule frequency will stop the service from repeating the upgrade routine in the future, but will not cancel the first upgrade based on `ltefw-upgrade-time`.

However, by unsetting `ltefw-upgrade-time`, you can cancel both the next schedule time and the frequency altogether.



We recommend using `unset ltefw-upgrade-time` to clear the schedule entirely before setting a new one.

```
FG30EGT819001087 # dia test app forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: on
    LTE Image next upgrade pushdown is scheduled at (UTC) Thu Aug 15 19:00:00 2019
    LTE Image upgrade frequency is every 1 hours.
    Last upgrade was at (UTC) Thu Aug 15 17:54:43 2019

FG30EGT819001087 #
FG30EGT819001087 #
FG30EGT819001087 # config sys central-management

FG30EGT819001087 (central-management) # sh
config system central-management
    set type fortiguard
    set ltefw-upgrade-time "12:00:00"
    set ltefw-upgrade-frequency everyHour
end

FG30EGT819001087 (central-management) # unset ltefw-upgrade-time
This operation will also cancel the repeated upgrade routine! Upgrade frequency will now set to None.
Do you want to continue? (y/n)y

FG30EGT819001087 (central-management) # sh
config system central-management
    set type fortiguard
end

FG30EGT819001087 (central-management) # end

FG30EGT819001087 # dia test app forticldd 13
Scheduled Image Upgrade: no
Scheduled Config Restore: no
Scheduled Script Restore: no
Scheduled LTE Firmware Image Upgrade: no
    Last upgrade was at (UTC) Thu Aug 15 17:54:43 2019
```

As shown in the preceding illustration, the schedule timer is deregistered because the whole schedule is canceled by unsetting the `ltefw-upgrade-time`. The command requires user confirmation to continue.

What's happening during the upgrade process

Once the upgrade process starts, the device starts to read the current image preference from the modem and saves it to the flash. This ensures that you can restore the existing working modem image in case the upgrade fails.

During the upgrade, you may encounter issues such as interruption, missing firmware information, or image corruption, which will cause the upgrade to fail.

If the modem doesn't work properly after upgrade, you should try to upgrade it again. If the problem persists, you should contact [Fortinet Support](#) for assistance.

During the upgrade, the LTE daemon sets the firmware image preference on the modem and then reboots the modem. The rest of the process is then handled by Qualcomm's QDL protocol.

When the upgrade is completed, the modem automatically reboots and comes back in application mode. The device then retrieves the "old" image preference from the flash, and compares it with the newly upgraded image files. If they match, it will delete the image preference file stored on the flash and the temp image files. After that, the modem starts working with the new modem firmware.

Examples of upgrade console output

This sections provides console output examples for the following upgrade methods:

- [Manual upgrade from USB on page 23](#)
- [Manual upgrade from FTP on page 25](#)
- [Manual upgrade from TFTP on page 28](#)
- [Manual upgrade from FortiGuard on page 31](#)
- [Scheduled upgrade from FortiGuard on page 34](#)

Manual upgrade from USB

```
FG30EGT819002892 # diagnose test application lted 17
Image list[0] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
Max images ==> 4
Index of running image ==> 255
```

```
Sublist[0] of 1 in image list[0]
Storage_indx ==> 1
Failure_count ==> 0
Unique id ==> ?_?
Build id ==> 01.08.04.00_?
```

```
Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 255
```

```
Sublist[0] of 1 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.012_000
Build id ==> 01.08.04.00_GENERIC
```

```
FG30EGT819002892 # execute lte-modem get-modem-firmware usb SWI9X50C_01.07.02.00.cwe
```

```
Please wait...
```

```
Copy image SWI9X50C_01.07.02.00.cwe from USB disk ...
Get image from USB disk OK.
```

```
FG30EGT819002892 # execute lte-modem get-pri-firmware usb SWI9X50C_01.07.02.00_ATT_002.008_004.nvu
Please wait...
```

```
Copy image SWI9X50C_01.07.02.00_ATT_002.008_004.nvu from USB disk ...
```

Get image from USB disk OK.

FG30EGT819002892 # execute lte-modem start-upgrade
You are going to burn the following images into your LTE modem.

Modem image: SWI9X50C_01.07.02.00.cwe
PRI image: SWI9X50C_01.07.02.00_ATT_002.008_004.nvu

The original images on your LTE Modem will be replaced!

Do you want to continue? (y/n)y

Starting LTE Modem firmware upgrade, please don't power off your device
until the whole process is done!

LTE Modem firmware upgrade routine will run in the background.

Reset modem to start upgrade!

.....

Now write firmware to modem, it may take several minutes...

New firmware successfully written, wait for the modem to reboot...

Modem has rebooted, wait for image verification...

.....Image information from the modem:

Modem image count ==> 2

Image type ==> 0

Modem firmware version ==> 01.07.02.00

PRI firmware version ==> 002.008_004

Carrier abbr ==> ATT

Image type ==> 1

Modem firmware version ==> 01.07.02.00

PRI firmware version ==> 002.008_004

Carrier abbr ==> ATT

Modem name ==> EM7565

Information from the image file

Image model name = SWI9X50C

Image modem firmware version = 01.07.02.00

Image carrier name = ATT

Image carrier PRI version = 002.008

Image carrier pack version = 004

.

EM7565 Modem Firmware Upgrade Process succeeded!

It is recommended to reboot the device!

FG30EGT819002892 # diagnose test application lted 17

Image list[0] of 2

Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM

Max images ==> 4

Index of running image ==> 2

Sublist[0] of 2 in image list[0]

Storage_indx ==> 1

Failure_count ==> 0

Unique id ==> ?_?

Build id ==> 01.08.04.00_?


```
Sublist[1] of 2 in image list[0]
Storage_indx ==> 2
Failure_count ==> 0
Unique id ==> ?_?
Build id ==> 01.07.02.00_?

Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 0

Sublist[0] of 2 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.008_004
Build id ==> 01.07.02.00_ATT

Sublist[1] of 2 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.012_000
Build id ==> 01.08.04.00_GENERIC
```

Manual upgrade from FTP

```
Gate-30E-3G4G-GBL # diagnose test application lted 17
Image list[0] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
Max images ==> 4
Index of running image ==> 2

Sublist[0] of 2 in image list[0]
Storage_indx ==> 1
Failure_count ==> 0
Build id ==> 01.08.04.00_?

Sublist[1] of 2 in image list[0]
Storage_indx ==> 2
<Current running modem image>
Failure_count ==> 0
Build id ==> 01.07.02.00_?

Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 0

Sublist[0] of 2 in image list[1]
Firmware_indx ==> 0
<Current loaded PRI profile>
Unique id ==> 002.008_004
Build id ==> 01.07.02.00_ATT
```

```
Sublist[1] of 2 in image list[1]
Firmware_indx ==> 1
Unique id ==> 002.015_001
Build id ==> 01.08.04.00_VERIZON
```

```
FortiGate-30E-3G4G-GBL # execute lte-modem get-modem-firmware ftp SWI9X50C_01.09.04.00.cwe
10.160.9.204 ftp_username ftp_password
Please wait...
```

```
Connect to ftp server 10.160.9.204 ...
Get image from ftp server OK.
```

```
FortiGate-30E-3G4G-GBL # execute lte-modem get-pri-firmware ftp SWI9X50C_01.09.04.00_
SOFTBANK_002.017_000.nvu 10.160.9.204 ftp_username ftp_password
Please wait...
```

```
Connect to ftp server 10.160.9.204 ...
Get image from ftp server OK.
```

```
FortiGate-30E-3G4G-GBL # execute lte-modem start-upgrade
You are going to burn the following images into your LTE modem.
```

```
-----
Modem image:          SWI9X50C_01.09.04.00.cwe
PRI image:            SWI9X50C_01.09.04.00_SOFTBANK_002.017_000.nvu
-----
```

```
The original images on your LTE Modem will be replaced!
Do you want to continue? (y/n)y
```

```
Starting LTE Modem firmware upgrade, please don't power off your device
until the whole process is done!
```

```
LTE Modem firmware upgrade routine will run in the background.
```

```
FortiGate-30E-3G4G-GBL # .
```

```
Reset modem to start upgrade!
```

```
.....
```

```
Now write firmware to modem, it may take several minutes...
```

```
New firmware successfully written, wait for the modem to reboot...
```

```
Modem has rebooted, wait for image verification...
```

```
.....Image information from the modem:
```

```
Modem image count ==> 2
```

```
Image type ==> 0
```

```
Modem firmware version ==> 01.09.04.00
```

```
PRI firmware version ==> 002.017_000
```

```
Carrier abbr ==> SOFTBANK
```

```
Image type ==> 1
```

```
Modem firmware version ==> 01.09.04.00
```

```
PRI firmware version ==> 002.017_000
```

```
Carrier abbr ==> SOFTBANK
```

```
Modem name ==> EM7565
```

```
Information from the image file
Image model name = SWI9X50C
Image modem firmware version = 01.09.04.00
Image carrier name = SOFTBANK
Image carrier PRI version = 002.017
Image carrier pack version = 000
.
EM7565 Modem Firmware Upgrade Process succeeded!

It is recommended to reboot the device!

FortiGate-30E-3G4G-GBL # diagnose test application lted 17
Image list[0] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
Max images ==> 4
Index of running image ==> 3

Sublist[0] of 3 in image list[0]
Storage_indx ==> 1
Failure_count ==> 0
Build id ==> 01.08.04.00_?

Sublist[1] of 3 in image list[0]
Storage_indx ==> 2
Failure_count ==> 0
Build id ==> 01.07.02.00_?

Sublist[2] of 3 in image list[0]
Storage_indx ==> 3
<Current running modem image>
Failure_count ==> 0
Build id ==> 01.09.04.00_?

Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 1

Sublist[0] of 3 in image list[1]
Firmware_indx ==> 0
Unique id ==> 002.008_004
Build id ==> 01.07.02.00_ATT

Sublist[1] of 3 in image list[1]
Firmware_indx ==> 1
<Current loaded PRI profile>
Unique id ==> 002.017_000
Build id ==> 01.09.04.00_SOFTBANK

Sublist[2] of 3 in image list[1]
Firmware_indx ==> 2
Unique id ==> 002.015_001
Build id ==> 01.08.04.00_VERIZON
```

Manual upgrade from TFTP

```
FG30EGT819002892 # diagnose test application lted 17
Image list[0] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
Max images ==> 4
Index of running image ==> 255

Sublist[0] of 1 in image list[0]
Storage_indx ==> 1
Failure_count ==> 0
Unique id ==> ?_?
Build id ==> 01.08.04.00_?

Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 255

Sublist[0] of 1 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.012_000
Build id ==> 01.08.04.00_GENERIC

FG30EGT819002892 # execute lte-modem get-modem-firmware tftp SWI9X50C_01.07.02.00.cwe
192.168.99.110
Please wait...

Connect to tftp server 192.168.99.110 ...
#####

Get image from tftp server OK.

FG30EGT819002892 # execute lte-modem get-pri-firmware tftp SWI9X50C_01.07.02.00_ATT_002.008_
004.nvu 192.168.99.110
Please wait...

Connect to tftp server 192.168.99.110 ...

Get image from tftp server OK.

FG30EGT819002892 # execute lte-modem start-upgrade
You are going to burn the following images into your LTE modem.
-----
Modem image:          SWI9X50C_01.07.02.00.cwe
PRI image:            SWI9X50C_01.07.02.00_ATT_002.008_004.nvu
-----
The original images on your LTE Modem will be replaced!
Do you want to continue? (y/n)y

Starting LTE Modem firmware upgrade, please don't power off your device
until the whole process is done!
```

LTE Modem firmware upgrade routine will run in the background.

FG30EGT819002892 #

Reset modem to start upgrade!

.....

Now write firmware to modem, it may take several minutes...

New firmware successfully written, wait for the modem to reboot...

Modem has rebooted, wait for image verification...

.....

Image information from the modem:

Modem image count ==>2

Image type ==> 0

Modem firmware version ==> 01.07.02.00

PRI firmware version ==> 002.008_004

Carrier abbr ==> ATT

Image type ==> 1

Modem firmware version ==> 01.07.02.00

PRI firmware version ==> 002.008_004

Carrier abbr ==> ATT

Modem name ==> EM7565

Information from the image file

Image model name = SWI9X50C

Image modem firmware version = 01.07.02.00

Image carrier name = ATT

Image carrier PRI version = 002.008

Image carrier pack version = 004

.

EM7565 Modem Firmware Upgrade Process succeeded!

It is recommended to reboot the device!

FG30EGT819002892 # diagnose test application lted 17

Image list[0] of 2

Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM

Max images ==> 4

Index of running image ==> 2

Sublist[0] of 2 in image list[0]

Storage_indx ==> 1

Failure_count ==> 0

Unique id ==> ?_?

Build id ==> 01.08.04.00_?

Sublist[1] of 2 in image list[0]

Storage_indx ==> 2

Failure_count ==> 0

Unique id ==> ?_?

Build id ==> 01.07.02.00_?

Image list[1] of 2

Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI

Max images ==> 50

Index of running image ==> 0

Sublist[0] of 2 in image list[1]

Storage_indx ==> 255

Failure_count ==> 255

Unique id ==> 002.008_004

Build id ==> 01.07.02.00_ATT

```
Sublist[1] of 2 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.012_000
Build id ==> 01.08.04.00_GENERIC
```

Manual upgrade from FortiGuard

```
FG30EGT819002892 # diagnose test application lted 17
```

```
Image list[0] of 2
```

```
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
```

```
Max images ==> 4
```

```
Index of running image ==> 1
```

```
Sublist[0] of 1 in image list[0]
Storage_indx ==> 1
Failure_count ==> 0
Unique id ==> ?_?
Build id ==> 01.08.04.00_?
```

```
Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 1
```

```
Sublist[0] of 2 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.012_000
Build id ==> 01.08.04.00_GENERIC
```

```
Sublist[1] of 2 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.015_001
Build id ==> 01.08.04.00_VERIZON
```

```
FG30EGT819002892 # execute lte-modem get-modem-firmware management-station
Available carrier:
GENERIC
ATT
```

VERIZON
TELUS
DOCOMO
SOFTBANK
SPRINT

FG30EGT819002892 # execute lte-modem get-modem-firmware management-station ATT
Please wait...

Getting image 00001000MIMG00000 from Management station...
#####

FG30EGT819002892 # execute lte-modem get-pri-firmware management-station ATT
Please wait...

Getting image 02001000MIMG01100 from Management station...
#####

FG30EGT819002892 # execute lte-modem start-upgrade
You are going to burn the following images into your LTE modem.

Modem image: 00001000MIMG00000.cwe
PRI image: 02001000MIMG01100.nvu

The original images on your LTE Modem will be replaced!
Do you want to continue? (y/n)y

Starting LTE Modem firmware upgrade, please don't power off your device
until the whole process is done!
LTE Modem firmware upgrade routine will run in the background.
Reset modem to start upgrade!

.....
Now write firmware to modem, it may take several minutes...

New firmware successfully written, wait for the modem to reboot...

Modem has rebooted, wait for image verification...

.....Image information from the modem:

Modem image count ==> 2
Image type ==> 0
Modem firmware version ==> 01.07.02.00
PRI firmware version ==> 002.008_004
Carrier abbr ==> ATT
Image type ==> 1
Modem firmware version ==> 01.07.02.00
PRI firmware version ==> 002.008_004
Carrier abbr ==> ATT
Modem name ==> EM7565

Information from the image file
Image model name = SWI9X50C
Image modem firmware version = 01.07.02.00


```
Image carrier name = ATT
Image carrier PRI version = 002.008
Image carrier pack version = 004
.
EM7565 Modem Firmware Upgrade Process succeeded!

It is recommended to reboot the device!

FG30EGT819002892 # diagnose test application lted 17
Image list[0] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
Max images ==> 4
Index of running image ==> 2

Sublist[0] of 2 in image list[0]
Storage_idx ==> 1
Failure_count ==> 0
Unique id ==> ?_?
Build id ==> 01.08.04.00_?

Sublist[1] of 2 in image list[0]
Storage_idx ==> 2
Failure_count ==> 0
Unique id ==> ?_?
Build id ==> 01.07.02.00_?

Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 0

Sublist[0] of 3 in image list[1]
Storage_idx ==> 255
Failure_count ==> 255
Unique id ==> 002.008_004
Build id ==> 01.07.02.00_ATT

Sublist[1] of 3 in image list[1]
Storage_idx ==> 255
Failure_count ==> 255
Unique id ==> 002.012_000
Build id ==> 01.08.04.00_GENERIC

Sublist[2] of 3 in image list[1]
Storage_idx ==> 255
Failure_count ==> 255
Unique id ==> 002.015_001
Build id ==> 01.08.04.00_VERIZON
```

Scheduled upgrade from FortiGuard

```
FG30EGT819002892 # diagnose test application lted 17
```

```
Image list[0] of 2
```

```
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
```

```
Max images ==> 4
```

```
Index of running image ==> 1
```

```
Sublist[0] of 1 in image list[0]
```

```
Storage_indx ==> 1
```

```
Failure_count ==> 0
```

```
Unique id ==> ?_?
```

```
Build id ==> 01.08.04.00_?
```

```
Image list[1] of 2
```

```
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
```

```
Max images ==> 50
```

```
Index of running image ==> 0
```

```
Sublist[0] of 1 in image list[1]

Storage_indx ==> 255

Failure_count ==> 255

Unique id ==> 002.015_000

Build id ==> 01.08.04.00_VERIZON

FG30EGT819002892 # execute ping 8.8.8.8

PING 8.8.8.8 (8.8.8.8): 56 data bytes

64 bytes from 8.8.8.8: icmp_seq=0 ttl=51 time=192.0 ms

64 bytes from 8.8.8.8: icmp_seq=1 ttl=51 time=69.8 ms

64 bytes from 8.8.8.8: icmp_seq=2 ttl=51 time=69.9 ms

64 bytes from 8.8.8.8: icmp_seq=3 ttl=51 time=49.8 ms

64 bytes from 8.8.8.8: icmp_seq=4 ttl=51 time=57.9 ms

FG30EGT819002892 # get system status
System time: Fri Aug 9 11:11:08 2019

FG30EGT819002892 # config system central
FG30EGT819002892 (central-management) # set allow-remote-lte-firmware-upgrade enable

FG30EGT819002892 (central-management) # set ltefw-upgrade-time "2019-08-09 11:12:30"

FG30EGT819002892 (central-management) # set ltefw-upgrade-frequency everyWeek
everyWeek
FG30EGT819002892 (central-management) # end
FG30EGT819002892 # Perform PRI(*.nvu) file object download...
Prepare for upgrade...

The latest Modem image already installed, skip Modem image installation.
The following firmware will be loaded into LTE Modem.
-----
PRI image:01.08.04.00_VERIZON_002.015_001.nvu
-----
Starting LTE Modem firmware upgrade, please don't power off your device
until the whole process is done!
LTE Modem firmware upgrade routine will run in the background..
```

```
Reset modem to start upgrade!
.....
Now write firmware to modem, it may take several minutes...

New firmware successfully written, wait for the modem to reboot...

Modem has rebooted, wait for image verification...
.....Image information from the modem:
Modem image count ==> 2
Image type ==> 0
Modem firmware version ==> 01.08.04.00
PRI firmware version ==> 002.015_001
Carrier abbr ==> VERIZON
Image type ==> 1
Modem firmware version ==> 01.08.04.00
PRI firmware version ==> 002.015_001
Carrier abbr ==> VERIZON
Modem name ==> EM7565

Information from the image file
Image model name = SWI9X50C
Image modem firmware version = 01.08.04.00
Image carrier name = VERIZON
Image carrier PRI version = 002.015
Image carrier pack version = 001
.
EM7565 Modem Firmware Upgrade Process succeeded!

It is recommended to reboot the device!

FG30EGT819002892 # diagnose test application lted 17
Image list[0] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_MODEM
Max images ==> 4
Index of running image ==> 1

Sublist[0] of 1 in image list[0]
Storage_indx ==> 1
Failure_count ==> 0
Unique id ==> ?_?
Build id ==> 01.08.04.00_?

Image list[1] of 2
Image Type ==> QMI_DMS_FIRMWARE_IMAGE_TYPE_PRI
Max images ==> 50
Index of running image ==> 0

Sublist[0] of 1 in image list[1]
Storage_indx ==> 255
Failure_count ==> 255
Unique id ==> 002.015_001
Build id ==> 01.08.04.00_VERIZON

FG30EGT819002892 # execute ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8): 56 data bytes
```

Examples of upgrade console output

```
64 bytes from 8.8.8.8: icmp_seq=0 ttl=51 time=231.2 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=51 time=74.5 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=51 time=67.6 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=51 time=60.6 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=51 time=57.6 ms
```

Debug

The following command enables debug messages for the modem image upgrade state transition.

```
# diagnose debug application lted 64
```

Failure recovery

During the upgrade, you could encounter a power outage, modem reboot caused by exceptions, or upgrade failure. As a result, the modem is unable to function properly because the internal image preference has changed.

If the device has not lost power when the modem comes back, the LTE process will try to recover the modem based on the modem recovery info file on the flash. In this case, the LTE daemon automatically sets the image preference of the modem to the same as what is stored in the recovery info file. This should automatically bring the modem back to its working condition.

The worst scenario is one in which the device has lost power. In this case, the device has lost the memory of the image upgrade completely. If this happens, you can use the following command to restore the image preference:

```
# diagnose test application lted 15
```

If the recovery info file is found, the image preference on the modem will be restored.

If the device is still unable to restore the modem after you have tried all of the methods mentioned above, you should try to upgrade the modem again. In most cases, this should restore the modem to its working order.



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